

What is claimed is:

1 1. An arc fault protection device, protective of an electrical distribution system
2 having a load, comprising:
3 a sensor for sensing arc fault signatures in the presence of unwanted arc fault
4 mimicking noise;
5 a load current threshold detector; and
6 first and second filters for distinguishing arc fault signatures from said
7 unwanted arc mimicking noise having first and second sets of characteristics,
8 respectively;
9 wherein said first filter is enabled if a load current is below said load current
10 threshold, and said second filter is enabled if said load current is above said load
11 current threshold.

1 2. A device according to claim 1, further comprising an interrupting mechanism
2 responsive to a signal from at least one of said first and second filters, wherein said
3 interrupting mechanism disconnects said load from said electrical distribution system.

1 3. A device according to claim 1, wherein said electrical distribution system is
2 protected by an overcurrent device having a rating, wherein said load threshold
3 current is below said rating of said overcurrent device.

1 4. A device according to claim 3, wherein said overcurrent device rating is between
2 about 15 to about 30 amperes.

1 5. A device according to claim 4, wherein said overcurrent device is a circuit breaker.

1 6. A device according to claim 4, wherein said overcurrent device is a fuse.

1 7. A device according to claim 1, wherein said sensor detects di/dt in said load
2 current.

1 8. A device according to claim 7, wherein said sensor includes a toroidal transformer.

1 9. A device according to claim 8, wherein said load current threshold detector derives
2 a signal from said toroidal transformer.

1 10. A device according to claim 8, wherein said load current threshold detector
2 derives a signal from a resistive shunt in series with a hot or neutral conductor of said
3 electrical distribution system.

1 11. A device according to claim 1, wherein said first and second filters are
2 incorporated in a microprocessor.

1 12. An arc fault protection device, protective of an electrical distribution system
2 having a load, comprising:
3 a sensor for sensing arc fault signatures in the presence of unwanted arc fault
4 mimicking noise;
5 a load current threshold detector; and
6 first and second filters for distinguishing arc fault signatures from said
7 unwanted arc mimicking noise having first and second sets of characteristics,
8 respectively;
9 wherein said first filter is enabled if a load current is below said load current
10 threshold, and said first and second filters are enabled if said load current is above
11 said load current threshold.

1 13. A device according to claim 12, further comprising an interrupting mechanism
2 responsive to a signal from at least one of said first and second filters, wherein said
3 interrupting mechanism disconnects said load from said electrical distribution system.

1 14. A device according to claim 12, wherein said electrical distribution system is
2 protected by an overcurrent device having a rating, wherein said load current
3 threshold is below said rating of said overcurrent device.

1 15. A device according to claim 12, wherein said sensor detects di/dt in said load
2 current.

1 16. A device according to claim 15, wherein said sensor includes a toroidal
2 transformer.

1 17. A device according to claim 12, wherein said load current threshold detector
2 derives a signal from a resistive shunt in series with a hot or neutral conductor of said
3 electrical distribution system.

1 18. A device according to claim 12, wherein said first and second filters are
2 incorporated in a microprocessor.

1 19. An arc fault protection device, protective of an electrical distribution system
2 having a load, comprising:
3 a sensor for sensing arc fault signatures in the presence of unwanted arc fault
4 mimicking noise;
5 a first load current threshold detector;
6 a second load current threshold detector; and
7 first and second filters for distinguishing arc fault signatures from said
8 unwanted arc mimicking noise having first and second sets of characteristics,
9 respectively;
10 wherein said first filter is enabled if a load current exceeds said first load
11 current threshold, and said second filter is enabled if said load current exceeds said
12 second load current threshold.

1 20. A device according to claim 19, further comprising an interrupting mechanism
2 responsive to a signal from at least one of said first and second filters, wherein said
3 interrupting mechanism disconnects said load from said electrical distribution system.

1 21. A device according to claim 19, wherein said electrical distribution system is
2 protected by an overcurrent device having a rating, wherein said second load current
3 threshold is below said rating of said overcurrent device.

1 22. A device according to claim 19, wherein said sensor detects di/dt in said load
2 current.

1 23. A device according to claim 22, wherein said sensor includes a toroidal
2 transformer.

1 24. A device according to claim 19, wherein at least one of said first and second load
2 current threshold detectors derives a signal from a resistive shunt in series with a hot
3 or neutral conductor of said electrical distribution system.

1 25. A device according to claim 19, wherein said first and second filters are
2 incorporated in a microprocessor.

1 26. A device according to claim 19, wherein said first load current threshold detector
2 is set below said second load current threshold detector; and said first and second
3 filters are disabled if said load current is below said first load current threshold.

1 27. A device according to claim 26, wherein said first load current threshold is about
2 5 amperes.

1 28. An arc fault protection device, protective of an electrical distribution system
2 having a load, comprising:

3 means for sensing arc fault signatures in the presence of unwanted arc fault
4 mimicking noise;

5 a load current threshold detector; and

6 first and second filter means for distinguishing arc fault signatures from said
7 unwanted arc mimicking noise having first and second sets of characteristics,
8 respectively;

9 wherein said first filter means is enabled if a load current is below said load
10 current threshold, and said second filter means is enabled if said load current is above
11 said load current threshold.

1 29. An arc fault protection device, protective of an electrical distribution system
2 having a load, comprising:

3 means for sensing arc fault signatures in the presence of unwanted arc fault
4 mimicking noise;

5 a load current threshold detector; and

6 first and second filter means for distinguishing arc fault signatures from said
7 unwanted arc mimicking noise having first and second sets of characteristics,
8 respectively;

9 wherein said first filter means is enabled if a load current is below said load
10 current threshold, and said first and second filter means are enabled if said load
11 current is above said load current threshold.

1 30. An arc fault protection device, protective of an electrical distribution system
2 having a load, comprising:

3 means for sensing arc fault signatures in the presence of unwanted arc fault
4 mimicking noise;

5 a first load current threshold detector;

6 a second load current threshold detector; and

7 first and second filter means for distinguishing arc fault signatures from said
8 unwanted arc mimicking noise having first and second sets of characteristics,
9 respectively;

10 wherein said first filter means is enabled if a load current exceeds said first
11 load current threshold, and said second filter means is enabled if said load current
12 exceeds said second load current threshold.

1 31. An arc fault protection device, protective of an electrical distribution system
2 which includes at least first and second conductors and having a load connected
3 across said first and second conductors, comprising:
4 detecting means for detecting a di/dt signal on one of said first and second
5 conductors;
6 sensing means for sensing a load current of said electrical distribution system;
7 and
8 determining means for determining whether said di/dt signal is indicative of
9 noise, a parallel arc fault, or a series arc fault.

1 32. A device according to claim 31, further comprising interrupting means,
2 responsive to said determining means, for interrupting said electrical distribution
3 system from said load when an arc fault is present.

1 33. A device according to claim 31, wherein said determining means uses a first set
2 of characteristics to determine whether said di/dt signal is indicative of noise or a high
3 level arc fault and a second set of characteristics to determine whether said di/dt
4 signal is indicative of noise or a low level arc fault.

1 34. A device according to claim 33, wherein said determining means uses either said
2 first set of characteristics or said second set of characteristics based on input received
3 from said sensing means.

1 35. A device according to claim 34, wherein said sensing means includes means for
2 comparing a magnitude of a line frequency of said electrical distribution system to a
3 predetermined level.

1 36. A device according to claim 34, wherein said sensing means includes a resistive
2 shunt sensor.

1 37. A device according to claim 34, wherein said sensing means includes a toroidal
2 transformer.

1 38. A device according to claim 31, wherein said determining means uses a first set
2 of characteristics to determine whether said di/dt signal is indicative of noise, a
3 parallel arc fault, or a series arc fault and a second set of characteristics to determine
4 whether said di/dt signal is indicative of noise or an arc fault when an arcing current
5 exceeds a rating of an overcurrent protection device protecting said electrical
6 distribution system.

1 39. A method for protecting an electrical distribution system which includes at least
2 first and second conductors and having a load connected across said first and second
3 conductors, comprising the steps of:
4 detecting a di/dt signal on one of said first and second conductors;
5 sensing a load current of said electrical distribution system; and
6 determining whether said di/dt signal is indicative of noise, a parallel arc fault,
7 or a series arc fault.

1 40. A method according to claim 39, further comprising the step of interrupting said
2 electrical distribution system from said load when an arc fault is present.

1 41. A method according to claim 39, wherein said step of determining uses a first set
2 of characteristics to determine whether said di/dt signal is indicative of noise or a high
3 level arc fault and a second set of characteristics to determine whether said di/dt
4 signal is indicative of noise or a low level arc fault.

1 42. A method according to claim 41, wherein said step of determining uses either
2 said first set of characteristics or said second set of characteristics based on input
3 received from said step of sensing.

1 43. A method according to claim 42, wherein said step of sensing includes comparing
2 a magnitude of a line frequency of said electrical distribution system to a
3 predetermined level.

1 44. A method according to claim 41, wherein said step of sensing includes
2 connecting a resistive shunt sensor to one of said conductors.

1 45. A method according to claim 41, wherein said step of sensing includes
2 connecting a toroidal transformer to one of said conductors.

1 46. A method according to claim 39, wherein said step of determining uses a first set
2 of characteristics to determine whether said di/dt signal is indicative of noise, a
3 parallel arc fault, or a series arc fault and a second set of characteristics to determine
4 whether said di/dt signal is indicative of noise or an arc fault when an arcing current
5 exceeds a rating of an overcurrent protection device protecting said electrical
6 distribution system.